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PATENT AND TRADEMARK OFFICEATTORNEY'S DOCKET NUMBER  
10191/1949**TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371**

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

**10/009670**INTERNATIONAL APPLICATION NO.  
**PCT/DE00/01560**INTERNATIONAL FILING DATE  
**18 May 2000**  
(18.05.00)PRIORITY DATE CLAIMED:  
**19 May 1999**  
(19.05.99)TITLE OF INVENTION  
**METHOD OF KEYLESS LOCKING OF A MOTOR VEHICLE**APPLICANT(S) FOR DO/EO/US  
**Elmar GIEHLER, Achim WACH, and Karl-Heinz KAISER**

Applicants herewith submit to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) immediately rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☒ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) (unsigned).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11. to 16. below concern other document(s) or information included:**

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
14. ☒ A substitute specification and marked-up version thereof.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: International Search Report (translated), Preliminary Examination Report and PCT/RO/101.

EXPRESS MAIL NO.: EV 003624570us

17. ☒ The following fees are submitted:**Basic National Fee (37 CFR 1.492(a)(1)-(5)):**

Search Report has been prepared by the EUROPEAN PATENT OFFICE or

JPO ..... q\$860.00

International preliminary examination fee paid to USPTO (37 CFR 1.482) ..... \$690.00

No international preliminary examination fee paid to USPTO (37 CFR 1.482) but  
international search fee paid to USPTO (37 CFR 1.445(a)(2)) ..... \$710.00Neither international preliminary examination fee (37 CFR 1.482) nor international search  
fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$1,000.00International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims  
satisfied provisions of PCT Article 33(2)-(4) ..... \$100.00

CALCULATIONS | PTO USE ONLY

**ENTER APPROPRIATE BASIC FEE AMOUNT =** \$ 860Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months  
from the earliest claimed priority date (37 CFR 1.492(e)).

\$

Claims	Number Filed	Number Extra	Rate
Total Claims	7 - 20 =	0	X \$18.00
Independent Claims	1 - 3 =	0	X \$80.00
Multiple dependent claim(s) (if applicable)			+ \$270.00

\$ 0

\$ 0

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**TOTAL OF ABOVE CALCULATIONS =** \$ 860Reduction by ½ for filing by small entity, if applicable. Verified Small Entity statement must  
also be filed. (Note 37 CFR 1.9, 1.27, 1.28).

\$

**SUBTOTAL =** \$ 860Processing fee of \$130.00 for furnishing the English translation later the ☐ 20 ☐ 30  
months from the earliest claimed priority date (37 CFR 1.492(f)).

\$

+

**TOTAL NATIONAL FEE =** \$ 860Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be  
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property

\$

+

**TOTAL FEES ENCLOSED =** \$ 860

Amount to be:	
refunded	\$
charged	\$

a. ☐ A check in the amount of \$\_\_\_\_\_ to cover the above fees is enclosed.b. ☒ Please charge my Deposit Account No. 11-0600 in the amount of **\$860.00** to cover the above fees. A duplicate copy of this sheet  
is enclosed.c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit  
Account No. 11-0600. A duplicate copy of this sheet is enclosed.**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be  
filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:  
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SIGNATURE

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NAME

DATE

11/12/01

[10191/1949]

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant(s) : GIEHLER et al.  
Serial No. : To Be Assigned  
Filed : Herewith  
For : METHOD OF KEYLESS LOCKING  
OF A MOTOR VEHICLE  
  
Art Unit : To Be Assigned  
Examiner : To Be Assigned

Assistant Commissioner  
for Patents  
Washington, D.C. 20231  
Box Patent Application

**PRELIMINARY AMENDMENT AND  
37 C.F.R. § 1.125 SUBSTITUTE SPECIFICATION STATEMENT**

SIR:

Please amend the above-identified application before examination, as set forth below.

**IN THE SPECIFICATION AND ABSTRACT:**

In accordance with 37 C.F.R. § 1.121(b)(3), a Substitute Specification (including the Abstract, but without claims) accompanies this response. It is respectfully requested that the Substitute Specification (including Abstract) be entered to replace the Specification of record.

**IN THE CLAIMS:**

On the first page of the claims, first line, change "What is claimed is:" to:  
--What Is Claimed Is:--.

Please cancel original claims 1 to 7, without prejudice, in the underlying PCT Application  
No. PCT/DE00/01560.

Please add the following new claims:

8. (New) A method of keyless locking of a motor vehicle that includes a transponder that exchanges a code with a transceiver, the motor vehicle including a control unit that compares the code with an expected code and, if a match is found, controls a closing system of the motor vehicle by locking the motor vehicle, the motor vehicle including at least one display arrangement activated by the control unit and including at least one operating element on an operation of which a locking command is generated, the method comprising the steps of:

causing the transceiver to deliver a search signal when the at least one operating element is actuated in order to determine a position of the transponder on the basis of the code sent back by the transponder;

activating the at least one display arrangement when the transponder is at least one of in an interior of the motor vehicle and on a side of the motor vehicle opposite the actuated at least one operating element; and

activating the closing system by locking the closing system when the at least one operating element is actuated again.

9. (New) The method according to claim 8, wherein:

the closing system is activated to lock the motor vehicle so that a vehicle door can be opened only by at least one internal operating element in the interior of the motor vehicle.

10. (New) The method according to claim 8, wherein:

the closing system is activated to lock the motor vehicle so that a vehicle door can be opened by an internal operating element only for a period of time.

11. (New) The method according to claim 8, wherein:

an opening of a vehicle door by an internal operating element is not possible after a period of time has elapsed.

12. (New) The method according to claim 8, further comprising the step of:  
deactivating the transponder, when recognized in the interior, so that the code sent  
by the transponder is not recognized as permissible.
13. (New) The method according to claim 8, further comprising the step of:  
storing additional information in a memory on deactivation of the transponder located in  
the interior of the motor vehicle.
14. (New) The method according to claim 8, wherein:  
an activation of the transponder that has been deactivated occurs on unlocking the  
closing system.

#### **Remarks**

This Preliminary Amendment cancels original claims 1 to 7, without prejudice, in the underlying PCT Application No. PCT/DE00/01560. The Preliminary Amendment also adds new claims 8-14. The new claims conform the claims to U.S. Patent and Trademark Office rules and do not add new matter to the application.

In accordance with 37 C.F.R. § 1.121(b)(3), the Substitute Specification (including the Abstract, but without the claims) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to U.S. Patent and Trademark Office rules or to correct informalities. As required by 37 C.F.R. § 1.121(b)(3)(iii) and § 1.125(b)(2), a Marked Up Version Of The Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) are respectfully requested.

The underlying PCT Application No. PCT/DE00/01560 includes an International Search Report, dated October 18, 2000, and an International Preliminary Examination Report, dated May 23, 2001, copies of which are submitted herewith.

Applicants assert that the subject matter of the present application is new, non-obvious, and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully Submitted,

KENYON & KENYON

Dated: 11/12/01

By: *Richard L. Mayer*  
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[10191/1949]

## METHOD OF KEYLESS LOCKING OF A MOTOR VEHICLE

### Field Of The Invention

The present invention relates to a method of keyless locking of a motor vehicle.

### Background Information

European Patent No. 158,354 describes a keyless access system for motor vehicles having a portable transceiver. Authorization of a user to gain access and to drive a vehicle is verified on the basis of a signal emitted by the transceiver. If locking is desired, the user is notified by an alarm signal indicating that the transceiver is still in the interior of the vehicle in order to avoid lock-in of the transceiver. Final locking of the vehicle, however, is performed only after a certain period of time has elapsed to allow the user an opportunity to retrieve the transceiver from the interior of the vehicle within this period of time. If the user fails to do so, the vehicle is locked and the transceiver inside the vehicle is deactivated. Renewed access to the interior of the vehicle is only possible in combination with a mechanical vehicle key.

If a user does not react promptly to the warning signal transmitted, a great deal of effort is required to gain access to the vehicle again.

### Summary Of The Invention

An object of the present invention is to provide a user-friendly operating concept without neglecting security against unauthorized use.

The method according to the present invention for keyless locking of a motor vehicle includes a transponder which exchanges a code with a transceiver. A control unit compares this code with an expected code and controls a closing system of the vehicle in the sense of

locking it if the code matches. The control unit also activates a display arrangement. A locking command is generated when an operating element is actuated. In a first step, the transceiver delivers a search signal when the operating element is actuated to determine the position of the transponder on the basis of the response signal sent back by the transponder.

5 In a second step, the display arrangement is activated when the transponder is in the interior of the motor vehicle or on a side of the vehicle opposite the operating element actuated. In a third step, the closing system is activated in the sense of locking when the operating element has been actuated again. The display arrangement provides the user with an unambiguous indication that he is about to leave his transponder inside the vehicle. This gives the user an opportunity to retrieve the transponder from the vehicle. The display arrangement is also activated when the passenger is in possession of a transponder but the driver on the driver's side actuates the operating element to trigger a locking operation. In this case, locking does not take place immediately, and instead the same warning sequence is carried out as for the case when the transponder is still in the interior of the vehicle. However, locking is performed immediately if the transponder is on the same side of the vehicle as the side where the operating element was actuated. This also covers the situation in which an unauthorized person is seeking to trigger a locking on the passenger's side when the driver is on the driver's side with the proper transponder at the same moment. In this case, locking is suppressed at first and is carried out only when the operating element is actuated again.

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20 However, this action is preceded by display of a warning signal so that the user is notified of this critical situation.

In an advantageous refinement, the closing system is activated in the sense of locking in the third step in such a manner that the vehicle door can be opened only by an internal operating element in the interior of the vehicle. Thus, a passenger in the interior of the vehicle carrying his own transponder can leave the vehicle to escape being locked inside the vehicle. In an advantageous refinement, this possibility is provided for a predeterminable period of time. After this period of time has elapsed, the closing system will no longer allow the door to be opened by the internal operating element. Thus, in the event of a possible burglary attempt,

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30 the closing system reaches a state in which a thief is prevented from opening the vehicle by using the internal operating element after destroying the side window, for example.



In the third step, an advantageous embodiment provides for transponders recognized in the interior of the vehicle to be deactivated so that a code emitted by them is no longer recognized as permissible. Misuse of transponders remaining in the interior of the vehicle is then no longer possible. Furthermore, additional information such as the time of day or the kilometer reading can also be stored in a memory on deactivation of the transponders in the interior of the vehicle. This information can be used as evidence for insurance purposes.

An advantageous embodiment provides for activation of the transponders deactivated in the third step on unlocking of the closing system. Unlocking is preceded by an exchange of codes with a valid transponder. This guarantees that only an authorized person having a transponder can gain access to the transponders remaining in the interior. Transponders in the interior of the vehicle are of no value for a thief, however, because the information regarding deactivation of the transponder is stored in the control unit. It would be extremely difficult for a thief to gain access to this information.

#### Brief Description Of The Drawings

Figure 1 shows a block diagram.

Figure 2 shows a flow chart of the embodiment.

#### Detailed Description

An exterior light 22 of motor vehicle 8 is activated by a control unit 14 over a bus system 28. On the left side of vehicle 8, there is a left outside operating element 16, preferably in the area of the door handle, and on the right outside there is a right outside operating element 18. Two inside operating elements 26 are located in the interior of motor vehicle 8. The switch signals of outside operating elements 16, 18 and inside operating elements 26 are relayed from a signal detection 20 to bus system 28. A transponder 30 equipped with a transponder operating element 32 exchanges signals with a left transceiver 10 arranged on the left side of vehicle 8 or with a right transceiver 12. Left and right transceivers 10, 12 are also connected to control unit 14 over bus system 28. Locking and unlocking of the vehicle doors are handled by a

closing system 24 which is designed as an electric power lock, for example. Closing system 24 is also capable of exchanging signals with control unit 14 over bus system 28. Control unit 14 also contains a memory 15. Control unit 14 controls a horn 17.

5 This embodiment is described below on the basis of the flow chart according to Figure 2. In the basic state, step 101, the engine of motor vehicle 8 has been turned off, the driver has left vehicle 8 and his door is closed. He would then like to lock vehicle 8. Left and right exterior operating elements 16, 18 are monitored for operation. If the output signal of one of outside operating elements 16, 18 changes, signal detection 20 relays the operating procedure, which is interpreted as a locking command, to control unit 14 over bus system 28. As an alternative operating procedure, operation of transponder operating element 32 could cause transponder 30 to send a locking command, which is relayed to control unit 14 over transceivers 10, 12 and bus system 28. Only if one of these operating procedures is detected is step 105 carried out. In this step, control unit 14 causes transceivers 10, 12 to send out a search signal. Left and right transceivers 10, 12 are preferably arranged on the B post of the motor vehicle. Through appropriate activation of transceivers 10, 12, an electromagnetic signal is emitted into the interior and also into the left and right exterior. The search signal causes transponders 30 within its range to send back a response signal. To obtain an unambiguous correlation of multiple transponders 30, a corresponding time slot, within which the response signal of respective transponder 30 is expected and which is known to be admissible by control unit 14, is assigned to each transponder 30.

A first transponder sends its response signal within a first time slot, a second transponder sends its response signal within a subsequent second time slot, etc. On the basis of this time allocation, control unit 14 determines which transponders 30 are within the detection range. Control unit 14 determines the position of respective transponder 30 on the basis of incoming transceiver signals. If transponder 30 is in the left outside area, only one signal is received by left transceiver 10 within the respective time slot. In the case of a transponder 30 in the interior of the vehicle, both left and right transceivers 10, 12 receive a response signal from transponder 30. A response signal received only by right transceiver 12 indicates that transponder 30 is located in the right outside area.

On the basis of the incoming transceiver signals, control unit 14 checks on whether one of the following conditions is met, step 107. If at least one transponder 30 is in the interior of motor vehicle 8 and/or if a transponder 30 has been detected in an outside area opposite the operating element 16, 18 which has been actuated and has triggered the locking command, the system executes the actions in step 109. Thus for example, the system switches to step 109 if the driver without the transponder operates left outside operating element 16 for the purpose of locking it and a passenger with a transponder is in the right outside area. This checks on whether the locking is carried out immediately only if the driver with respective transponder 30 on the driver's side has actuated left outside element 16. If this is the case, locking is carried out, step 108. Otherwise, control unit 14 controls outside light 22 and/or horn 17 in the sense of a warning signal to draw the attention of the user to an unusual transponder position, step 109. However, the locking is not yet carried out. This is performed only if an outside operating element 16, 18 and/or transponder operating element 32 has been actuated again. The corresponding query about operation takes place in step 111. The user is thus active again to perform the locking. It is thus assumed that although the user is aware of the critical transponder position, he is willing to actively take it into account. After the operation of outside operating elements 16, 18 had been completed, closing system 24 is activated in the sense of locking and at the same time a timer is started, step 113. Locking here is understood to be the situation which suppresses opening of the door via the outside door handle but allows opening via inside operating elements 26.

If a person is in the interior of motor vehicle 8, this person can leave the vehicle until the timer has reached the predefinable period of time. This condition is checked in step 115. After the specified period of time has elapsed, the motor vehicle is locked so that the door cannot be opened from the inside, or from the outside, step 117. On locking of motor vehicle 8, transponders 30, which are located in the interior and were detected in query 107, are deactivated. To do so, information that a signal delivered by a transponder 30 located in the interior has not been recognized as permissible is stored in control unit 14 and thus neither locking and unlocking nor driving authorization of motor vehicle 8 can be obtained. In addition to the deactivation information on transponder 30 in the interior, additional information is also stored in memory 15, describing the time or the kilometer reading of the transponder deactivation, for example.

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Deactivated transponders 30 can be activated if motor vehicle 8 has been unlocked regularly with the help of a transponder 30 which is still valid. It is then assumed that an authorized user has gained access to transponders 30 in the interior of the vehicle. The warning emitted in step 109 may also be displayed on a display present in motor vehicle 8. This is a message that a transponder 30 is present in the interior or that transponder 30 is in the opposite outside area. A corresponding voice output could also be provided.

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## Abstract Of The Disclosure

A method of keyless locking of a motor vehicle is described. A transponder exchanges a code with a transceiver. A control unit compares this code with the expected code and, if a match is found, activates a closing system of the vehicle in the sense of locking it. This control unit activates at least one display means. A locking command is generated on actuation of at least one operating element. In a first step, a search signal is delivered by the transceiver when the operating element is actuated in order to determine the position of the transponder on the basis of the response signal sent back by the transponder. In a second step, the display means is activated when the transponder is in the interior of the vehicle and/or on the side of the vehicle opposite the actuated operating element. In a third step, the closing system is activated in the sense of locking it if the operating element has been actuated again.

[10191/1949]

## METHOD OF KEYLESS LOCKING OF A MOTOR VEHICLE

Field Of The Invention [Background Information]

The present invention relates to [is based on] a method of keyless locking of a motor vehicle.  
[according to the definition of the species of the independent claim]

Background Information

European Patent No. 158,354 [B1] describes a keyless access system for motor vehicles having a portable transceiver. Authorization of a user to gain access and to drive a vehicle is verified on the basis of a signal emitted by the transceiver. If locking is desired, the user is notified by an alarm signal indicating that the transceiver is still in the interior of the vehicle in order to avoid lock-in of the transceiver. Final locking of the vehicle, however, is performed only after a certain period of time has elapsed to allow the user an opportunity to retrieve the transceiver from the interior of the vehicle within this period of time. If the user fails to do so, the vehicle is locked and the transceiver inside the vehicle is deactivated. Renewed access to the interior of the vehicle is only possible in combination with a mechanical vehicle key.

If a user does not react promptly to the warning signal transmitted, a great deal of effort is required to gain access to the vehicle again.

Summary Of The Invention

[The] An object of the present invention is to provide a user-friendly operating concept without neglecting security against unauthorized use. [This object is achieved by the features of the independent claim.

## Advantages of the Invention]

The method according to the present invention for keyless locking of a motor vehicle includes a transponder which exchanges a code with a transceiver. A control unit compares this code with an expected code and controls a closing system of the vehicle in the sense of locking it if the code matches. The control unit also activates a display [means] arrangement. A locking command is generated when an operating element is actuated. In a first step, the transceiver delivers a search signal when the operating element is actuated to determine the position of the transponder on the basis of the response signal sent back by the transponder. In a second step, the display [means] arrangement is activated when the transponder is in the interior of the motor vehicle or on a side of the vehicle opposite the operating element actuated. In a third step, the closing system is activated in the sense of locking when the operating element has been actuated again. The display [means] arrangement provides the user with an unambiguous indication that he is about to leave his transponder inside the vehicle. This gives the user an opportunity to retrieve the transponder from the vehicle. The display [means] arrangement is also activated when the passenger is in possession of a transponder but the driver on the driver's side actuates the operating element to trigger a locking operation. In this case, locking does not take place immediately, and instead the same warning sequence is carried out as for the case when the transponder is still in the interior of the vehicle. However, locking is performed immediately if the transponder is on the same side of the vehicle as the side where the operating element was actuated. This also covers the situation in which an unauthorized person is seeking to trigger a locking on the passenger's side when the driver is on the driver's side with the proper transponder at the same moment. In this case, locking is suppressed at first and is carried out only when the operating element is actuated again. However, this action is preceded by display of a warning signal so that the user is notified of this critical situation.

In an advantageous refinement, the closing system is activated in the sense of locking in the third step in such a manner that the vehicle door can be opened only by an internal operating element in the interior of the vehicle. Thus, a passenger in the interior of the vehicle carrying his own transponder can leave the vehicle to escape being locked inside the vehicle. In an advantageous refinement, this possibility is provided for a predeterminable period of time.

After this period of time has elapsed, the closing system will no longer allow the door to be opened by the internal operating element. Thus, in the event of a possible burglary attempt, the closing system reaches a state in which a thief is prevented from opening the vehicle by using the internal operating element after destroying the side window, for example.

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In the third step, an advantageous embodiment provides for transponders recognized in the interior of the vehicle to be deactivated so that a code emitted by them is no longer recognized as permissible. Misuse of transponders remaining in the interior of the vehicle is then no longer possible. Furthermore, additional information such as the time of day or the kilometer reading can also be stored in a memory on deactivation of the transponders in the interior of the vehicle. This information can be used as evidence for insurance purposes.

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An advantageous embodiment provides for activation of the transponders deactivated in the third step on unlocking of the closing system. Unlocking is preceded by an exchange of codes with a valid transponder. This guarantees that only an authorized person having a transponder can gain access to the transponders remaining in the interior. Transponders in the interior of the vehicle are of no value for a thief, however, because the information regarding deactivation of the transponder is stored in the control unit. It would be extremely difficult for a thief to gain access to this information. [Additional advantageous refinements are derived from additional dependent claims and from the description.]

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#### Drawing] Brief Description Of The Drawings

[An embodiment of the present invention is illustrated in the drawing and is described in greater detail below. ]

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Fig.] Figure 1 shows a block diagram[, and Fig. ].

Figure 2 shows a flow chart of the embodiment.

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#### Detailed Description [of the Embodiment]



An exterior light 22 of motor vehicle 8 is activated by a control unit 14 over a bus system 28. On the left side of vehicle 8, there is a left outside operating element 16, preferably in the area of the door handle, and on the right outside there is a right outside operating element 18. Two inside operating elements 26 are located in the interior of motor vehicle 8. The switch signals of outside operating elements 16, 18 and inside operating elements 26 are relayed from a signal detection 20 to bus system 28. A transponder 30 equipped with a transponder operating element 32 exchanges signals with a left transceiver 10 arranged on the left side of vehicle 8 or with a right transceiver 12. Left and right transceivers 10, 12 are also connected to control unit 14 over bus system 28. Locking and unlocking of the vehicle doors are handled by a closing system 24 which is designed as an electric power lock, for example. Closing system 24 is also capable of exchanging signals with control unit 14 over bus system 28. Control unit 14 also contains a memory 15. Control unit 14 controls a horn 17.

This embodiment is described below on the basis of the flow chart according to Figure 2. In the basic state, step 101, the engine of motor vehicle 8 has been turned off, the driver has left vehicle 8 and his door is closed. He would then like to lock vehicle 8. Left and right exterior operating elements 16, 18 are monitored for operation. If the output signal of one of outside operating elements 16, 18 changes, signal detection 20 relays the operating procedure, which is interpreted as a locking command, to control unit 14 over bus system 28. As an alternative operating procedure, operation of transponder operating element 32 could cause transponder 30 to send a locking command, which is relayed to control unit 14 over transceivers 10, 12 and bus system 28. Only if one of these operating procedures is detected is step 105 carried out. In this step, control unit 14 causes transceivers 10, 12 to send out a search signal. Left and right transceivers 10, 12 are preferably arranged on the B post of the motor vehicle. Through appropriate activation of transceivers 10, 12, an electromagnetic signal is emitted into the interior and also into the left and right exterior. The search signal causes transponders 30 within its range to send back a response signal. To obtain an unambiguous correlation of multiple transponders 30, a corresponding time slot, within which the response signal of respective transponder 30 is expected and which is known to be admissible by control unit 14, is assigned to each transponder 30.

A first transponder sends its response signal within a first time slot, a second transponder

sends its response signal within a subsequent second time slot, etc. On the basis of this time allocation, control unit 14 determines which transponders 30 are within the detection range. Control unit 14 determines the position of respective transponder 30 on the basis of incoming transceiver signals. If transponder 30 is in the left outside area, only one signal is received by left transceiver 10 within the respective time slot. In the case of a transponder 30 in the interior of the vehicle, both left and right transceivers 10, 12 receive a response signal from transponder 30. A response signal received only by right transceiver 12 indicates that transponder 30 is located in the right outside area.

On the basis of the incoming transceiver signals, control unit 14 checks on whether one of the following conditions is met, step 107. If at least one transponder 30 is in the interior of motor vehicle 8 and/or if a transponder 30 has been detected in an outside area opposite the operating element 16, 18 which has been actuated and has triggered the locking command, the system executes the actions in step 109. Thus for example, the system switches to step 109 if the driver without the transponder operates left outside operating element 16 for the purpose of locking it and a passenger with a transponder is in the right outside area. This checks on whether the locking is carried out immediately only if the driver with respective transponder 30 on the driver's side has actuated left outside element 16. If this is the case, locking is carried out, step 108. Otherwise, control unit 14 controls outside light 22 and/or horn 17 in the sense of a warning signal to draw the attention of the user to an unusual transponder position, step 109. However, the locking is not yet carried out. This is performed only if an outside operating element 16, 18 and/or transponder operating element 32 has been actuated again. The corresponding query about operation takes place in step 111. The user [must] is thus [be] active again to perform the locking. It is thus assumed that although the user is aware of the critical transponder position, he is willing to actively take it into account. After the operation of outside operating elements 16, 18 had been completed, closing system 24 is activated in the sense of locking and at the same time a timer is started, step 113. Locking here is understood to be the situation which suppresses opening of the door via the outside door handle but allows opening via inside operating elements 26.

If a person is in the interior of motor vehicle 8, this person can leave the vehicle until the timer has reached the predefinable period of time. This condition is checked in step 115.

After the specified period of time has elapsed, the motor vehicle is locked so that the door cannot be opened from the inside, or from the outside, step 117. On locking of motor vehicle 8, transponders 30, which are located in the interior and were detected in query 107, are deactivated. To do so, information that a signal delivered by a transponder 30 located in the interior has not been recognized as permissible is stored in control unit 14 and thus neither locking and unlocking nor driving authorization of motor vehicle 8 can be obtained. In addition to the deactivation information on transponder 30 in the interior, additional information is also stored in memory 15, describing the time or the kilometer reading of the transponder deactivation, for example.

Deactivated transponders 30 can be activated if motor vehicle 8 has been unlocked regularly with the help of a transponder 30 which is still valid. It is then assumed that an authorized user has gained access to transponders 30 in the interior of the vehicle. The warning emitted in step 109 may also be displayed on a display present in motor vehicle 8. This is a message that a transponder 30 is present in the interior or that transponder 30 is in the opposite outside area. A corresponding voice output could also be provided.

## Abstract Of The Disclosure

A method of keyless locking of a motor vehicle is described. A transponder [(30)] exchanges a code with a transceiver[(10, 12)]. A control unit [(14)] compares this code with the expected code and, if a match is found, activates a closing system [(24)] of the vehicle [(8)] in the sense of locking it. This control unit [(14)] activates at least one display means[(17, 22)]. A locking command is generated on actuation of at least one operating element[(16, 18, 32)]. In a first step[(105)], a search signal is delivered by the transceiver [(10, 12)] when the operating element [(16, 18, 32)] is actuated in order to determine the position of the transponder [(30)] on the basis of the response signal sent back by the transponder[(30)]. In a second step[(109)], the display means [(14, 22)] is activated when the transponder [(30)] is in the interior of the vehicle [(8)] and/or on the side of the vehicle opposite the actuated operating element[(16, 18, 32)]. In a third step[(113, 117)], the closing system [(24)] is activated in the sense of locking it if the operating element [(16, 18, 32)] has been actuated again.

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[10191/1949]

METHOD OF KEYLESS LOCKING OF A MOTOR VEHICLE

## Background Information

5 The present invention is based on a method of keyless locking of a motor vehicle according to the definition of the species of the independent claim. European Patent 158,354 B1 describes a keyless access system for motor vehicles having a portable transceiver.

10 Authorization of a user to gain access and to drive a vehicle is verified on the basis of a signal emitted by the transceiver. If locking is desired, the user is notified by an alarm signal indicating that the transceiver is still in the interior of the vehicle in order to avoid lock-in of the transceiver. Final locking of the vehicle, however, is performed only after a certain period of time has elapsed to allow the user an opportunity to retrieve the transceiver from the interior of the vehicle within this period of time. If the user fails to do so, the vehicle is locked and the transceiver inside the vehicle is deactivated. Renewed access to the interior of the vehicle is only possible in combination with a mechanical vehicle key.

15 If a user does not react promptly to the warning signal transmitted, a great deal of effort is required to gain access to the vehicle again. The object of the present invention is to provide a user-friendly operating concept without neglecting security against unauthorized use. This object is achieved by the features of the independent claim.

## 20 Advantages of the Invention

25 The method according to the present invention for keyless locking of a motor vehicle includes a transponder which exchanges a code with a transceiver. A control unit compares this code with an expected code and controls a closing system of the vehicle in the sense of locking it if the code matches. The control unit also activates a display means. A locking command is generated when an operating element is actuated. In a first step, the transceiver delivers a search signal when the operating element is actuated to determine the position of

the transponder on the basis of the response signal sent back by the transponder. In a second step, the display means is activated when the transponder is in the interior of the motor vehicle or on a side of the vehicle opposite the operating element actuated. In a third step, the closing system is activated in the sense of locking when the operating element has been actuated again. The display means provides the user with an unambiguous indication that he is about to leave his transponder inside the vehicle. This gives the user an opportunity to retrieve the transponder from the vehicle. The display means is also activated when the passenger is in possession of a transponder but the driver on the driver's side actuates the operating element to trigger a locking operation. In this case, locking does not take place immediately, and instead the same warning sequence is carried out as for the case when the transponder is still in the interior of the vehicle. However, locking is performed immediately if the transponder is on the same side of the vehicle as the side where the operating element was actuated. This also covers the situation in which an unauthorized person is seeking to trigger a locking on the passenger's side when the driver is on the driver's side with the proper transponder at the same moment. In this case, locking is suppressed at first and is carried out only when the operating element is actuated again. However, this action is preceded by display of a warning signal so that the user is notified of this critical situation.

In an advantageous refinement, the closing system is activated in the sense of locking in the third step in such a manner that the vehicle door can be opened only by an internal operating element in the interior of the vehicle. Thus, a passenger in the interior of the vehicle carrying his own transponder can leave the vehicle to escape being locked inside the vehicle. In an advantageous refinement, this possibility is provided for a predeterminable period of time. After this period of time has elapsed, the closing system will no longer allow the door to be opened by the internal operating element. Thus, in the event of a possible burglary attempt, the closing system reaches a state in which a thief is prevented from opening the vehicle by using the internal operating element after destroying the side window, for example.

In the third step, an advantageous embodiment provides for transponders recognized in the interior of the vehicle to be deactivated so that a code emitted by them is no longer recognized as permissible. Misuse of transponders remaining in the interior of the vehicle is then no longer possible. Furthermore, additional information such as the time of day or the kilometer reading can also be stored in a memory on deactivation of the transponders in the

interior of the vehicle. This information can be used as evidence for insurance purposes.

An advantageous embodiment provides for activation of the transponders deactivated in the third step on unlocking of the closing system. Unlocking is preceded by an exchange of codes with a valid transponder. This guarantees that only an authorized person having a transponder can gain access to the transponders remaining in the interior. Transponders in the interior of the vehicle are of no value for a thief, however, because the information regarding deactivation of the transponder is stored in the control unit. It would be extremely difficult for a thief to gain access to this information. Additional advantageous refinements are derived from additional dependent claims and from the description.

#### Drawing

An embodiment of the present invention is illustrated in the drawing and is described in greater detail below.

Fig. 1 shows a block diagram, and Fig. 2 shows a flow chart of the embodiment.

#### Description of the Embodiment

An exterior light 22 of motor vehicle 8 is activated by a control unit 14 over a bus system 28. On the left side of vehicle 8, there is a left outside operating element 16, preferably in the area of the door handle, and on the right outside there is a right outside operating element 18. Two inside operating elements 26 are located in the interior of motor vehicle 8. The switch signals of outside operating elements 16, 18 and inside operating elements 26 are relayed from a signal detection 20 to bus system 28. A transponder 30 equipped with a transponder operating element 32 exchanges signals with a left transceiver 10 arranged on the left side of vehicle 8 or with a right transceiver 12. Left and right transceivers 10, 12 are also connected to control unit 14 over bus system 28. Locking and unlocking of the vehicle doors are handled by a closing system 24 which is designed as an electric power lock, for example. Closing system 24 is also capable of exchanging signals with control unit 14 over bus system 28. Control unit 14 also contains a memory 15. Control unit 14 controls a horn 17.

This embodiment is described below on the basis of the flow chart according to Figure 2. In the basic state, step 101, the engine of motor vehicle 8 has been turned off, the driver has left vehicle 8 and his door is closed. He would then like to lock vehicle 8. Left and right exterior operating elements 16, 18 are monitored for operation. If the output signal of one of outside operating elements 16, 18 changes, signal detection 20 relays the operating procedure, which is interpreted as a locking command, to control unit 14 over bus system 28. As an alternative operating procedure, operation of transponder operating element 32 could cause transponder 30 to send a locking command, which is relayed to control unit 14 over transceivers 10, 12 and bus system 28. Only if one of these operating procedures is detected is step 105 carried out. In this step, control unit 14 causes transceivers 10, 12 to send out a search signal. Left and right transceivers 10, 12 are preferably arranged on the B post of the motor vehicle. Through appropriate activation of transceivers 10, 12, an electromagnetic signal is emitted into the interior and also into the left and right exterior. The search signal causes transponders 30 within its range to send back a response signal. To obtain an unambiguous correlation of multiple transponders 30, a corresponding time slot, within which the response signal of respective transponder 30 is expected and which is known to be admissible by control unit 14, is assigned to each transponder 30.

A first transponder sends its response signal within a first time slot, a second transponder sends its response signal within a subsequent second time slot, etc. On the basis of this time allocation, control unit 14 determines which transponders 30 are within the detection range. Control unit 14 determines the position of respective transponder 30 on the basis of incoming transceiver signals. If transponder 30 is in the left outside area, only one signal is received by left transceiver 10 within the respective time slot. In the case of a transponder 30 in the interior of the vehicle, both left and right transceivers 10, 12 receive a response signal from transponder 30. A response signal received only by right transceiver 12 indicates that transponder 30 is located in the right outside area.

On the basis of the incoming transceiver signals, control unit 14 checks on whether one of the following conditions is met, step 107. If at least one transponder 30 is in the interior of motor vehicle 8 and/or if a transponder 30 has been detected in an outside area opposite the operating element 16, 18 which has been actuated and has triggered the locking command, the system executes the actions in step 109. Thus for example, the system switches to step



109 if the driver without the transponder operates left outside operating element 16 for the purpose of locking it and a passenger with a transponder is in the right outside area. This checks on whether the locking is carried out immediately only if the driver with respective transponder 30 on the driver's side has actuated left outside element 16. If this is the case, locking is carried out, step 108. Otherwise, control unit 14 controls outside light 22 and/or horn 17 in the sense of a warning signal to draw the attention of the user to an unusual transponder position, step 109. However, the locking is not yet carried out. This is performed only if an outside operating element 16, 18 and/or transponder operating element 32 has been actuated again. The corresponding query about operation takes place in step 111. The user must thus be active again to perform the locking. It is thus assumed that although the user is aware of the critical transponder position, he is willing to actively take it into account. After the operation of outside operating elements 16, 18 had been completed, closing system 24 is activated in the sense of locking and at the same time a timer is started, step 113. Locking here is understood to be the situation which suppresses opening of the door via the outside door handle but allows opening via inside operating elements 26.

If a person is in the interior of motor vehicle 8, this person can leave the vehicle until the timer has reached the predefinable period of time. This condition is checked in step 115. After the specified period of time has elapsed, the motor vehicle is locked so that the door cannot be opened from the inside, or from the outside, step 117. On locking of motor vehicle 8, transponders 30, which are located in the interior and were detected in query 107, are deactivated. To do so, information that a signal delivered by a transponder 30 located in the interior has not been recognized as permissible is stored in control unit 14 and thus neither locking and unlocking nor driving authorization of motor vehicle 8 can be obtained. In addition to the deactivation information on transponder 30 in the interior, additional information is also stored in memory 15, describing the time or the kilometer reading of the transponder deactivation, for example.

Deactivated transponders 30 can be activated if motor vehicle 8 has been unlocked regularly with the help of a transponder 30 which is still valid. It is then assumed that an authorized user has gained access to transponders 30 in the interior of the vehicle. The warning emitted in step 109 may also be displayed on a display present in motor vehicle 8. This is a message that a transponder 30 is present in the interior or that transponder 30 is in the opposite outside

area. A corresponding voice output could also be provided.

NY 01 391645 v 1

What is claimed is:

1. A method of keyless locking of a motor vehicle, having a transponder (30) which exchanges a code with a transceiver (10, 12), having a control unit (14) which compares the code with an expected code and, if a match is found, controls a closing system (24) of the motor vehicle (8) in the sense of locking it, having at least one display means (17, 22) which is activated by the control unit (14), having at least one operating element (16, 18, 32) on whose operation a locking command is generated,

wherein the following steps are carried out:

- in a first step (105) a search signal is delivered by the transceiver (10, 12) when the operating element (16, 18, 32) is actuated in order to determine the position of the transponder (30) on the basis of the code sent back by the transponder (30);
- in a second step (109) the display means (17, 22) is activated when at least one transponder (30) is in the interior of the motor vehicle (8) and/or on the side of the vehicle opposite the actuated operating element (16, 18, 32);
- in a third step (113, 117) the closing system (24) is activated in the sense of locking it when an operating element (16, 18, 32) is actuated again.

2. The method according to Claim 1,

wherein in the third step (113, 117) the closing system (24) is activated in the sense of locking the vehicle in such a manner that the vehicle door can be opened only by at least one internal operating element (26) in the interior of the motor vehicle (8).

3. The method according to one of the preceding claims,

wherein the closing system (24) is activated in the third step (113, 117) in the sense of locking the vehicle in such a manner that the vehicle door can be opened by the internal operating element (26) only for a period of time.

4. The method according to one of the preceding claims,

wherein opening of the vehicle door by the internal operating element (26) is not possible after a period of time has elapsed.

5. The method according to one of the preceding claims,

wherein in the third step (113, 117) transponders (30) recognized in the interior are deactivated so that a code sent by this transponder (30) is not recognized as permissible.

6. The method according to one of the preceding claims,  
wherein additional information is stored in a memory (15) on deactivation of the transponders (30) located in the interior of the vehicle.

7. The method according to one of the preceding claims,  
wherein activation of the transponders (30) deactivated in the third step (113, 117) takes place on unlocking the closing system (24).

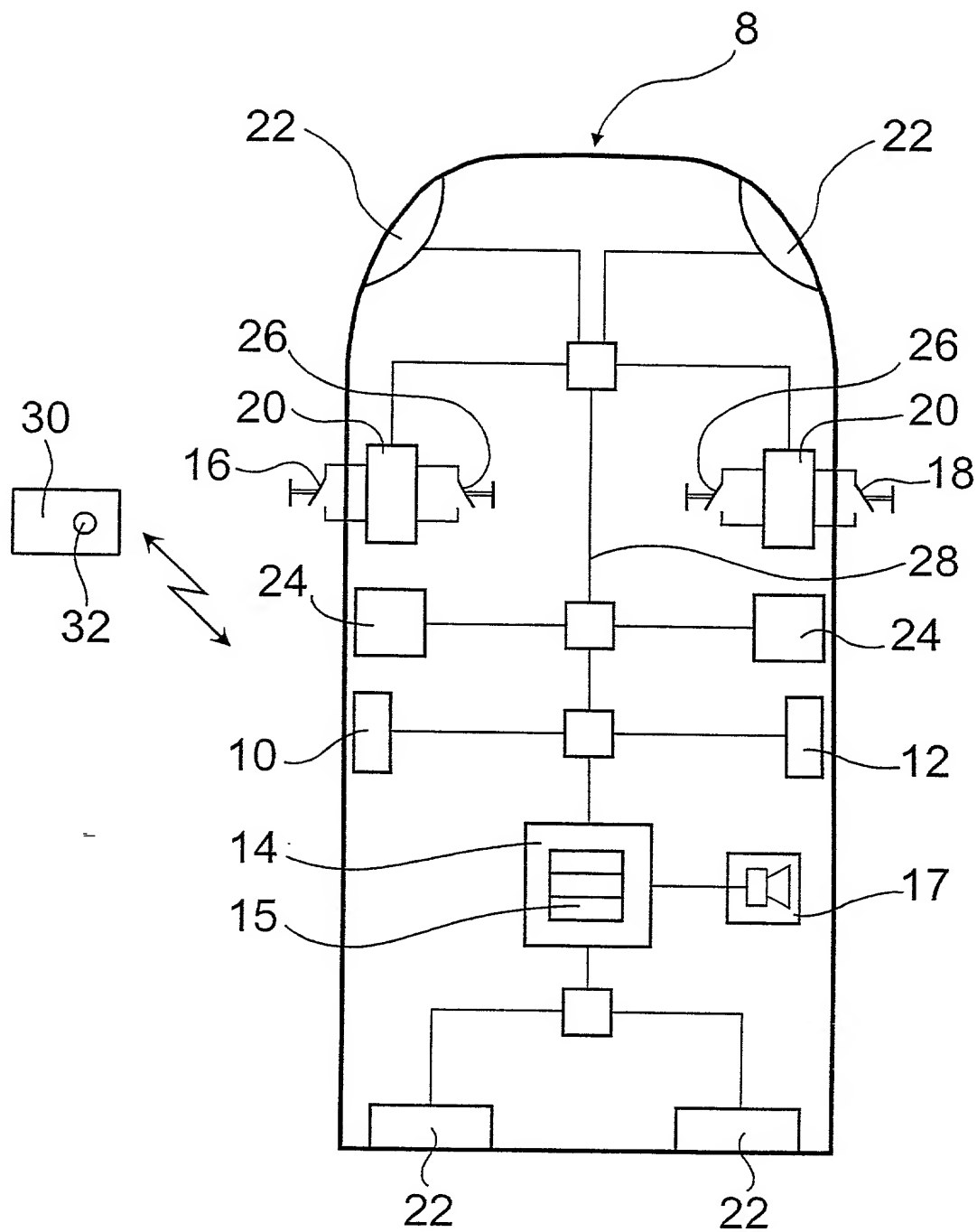
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## Abstract

A method of keyless locking of a motor vehicle is described. A transponder (30) exchanges a code with a transceiver (10, 12). A control unit (14) compares this code with the expected code and, if a match is found, activates a closing system (24) of the vehicle (8) in the sense of locking it. This control unit (14) activates at least one display means (17, 22). A locking command is generated on actuation of at least one operating element (16, 18, 32). In a first step (105), a search signal is delivered by the transceiver (10, 12) when the operating element (16, 18, 32) is actuated in order to determine the position of the transponder (30) on the basis of the response signal sent back by the transponder (30). In a second step (109), the display means (14, 22) is activated when the transponder (30) is in the interior of the vehicle (8) and/or on the side of the vehicle opposite the actuated operating element (16, 18, 32). In a third step (113, 117), the closing system (24) is activated in the sense of locking it if the operating element (16, 18, 32) has been actuated again.

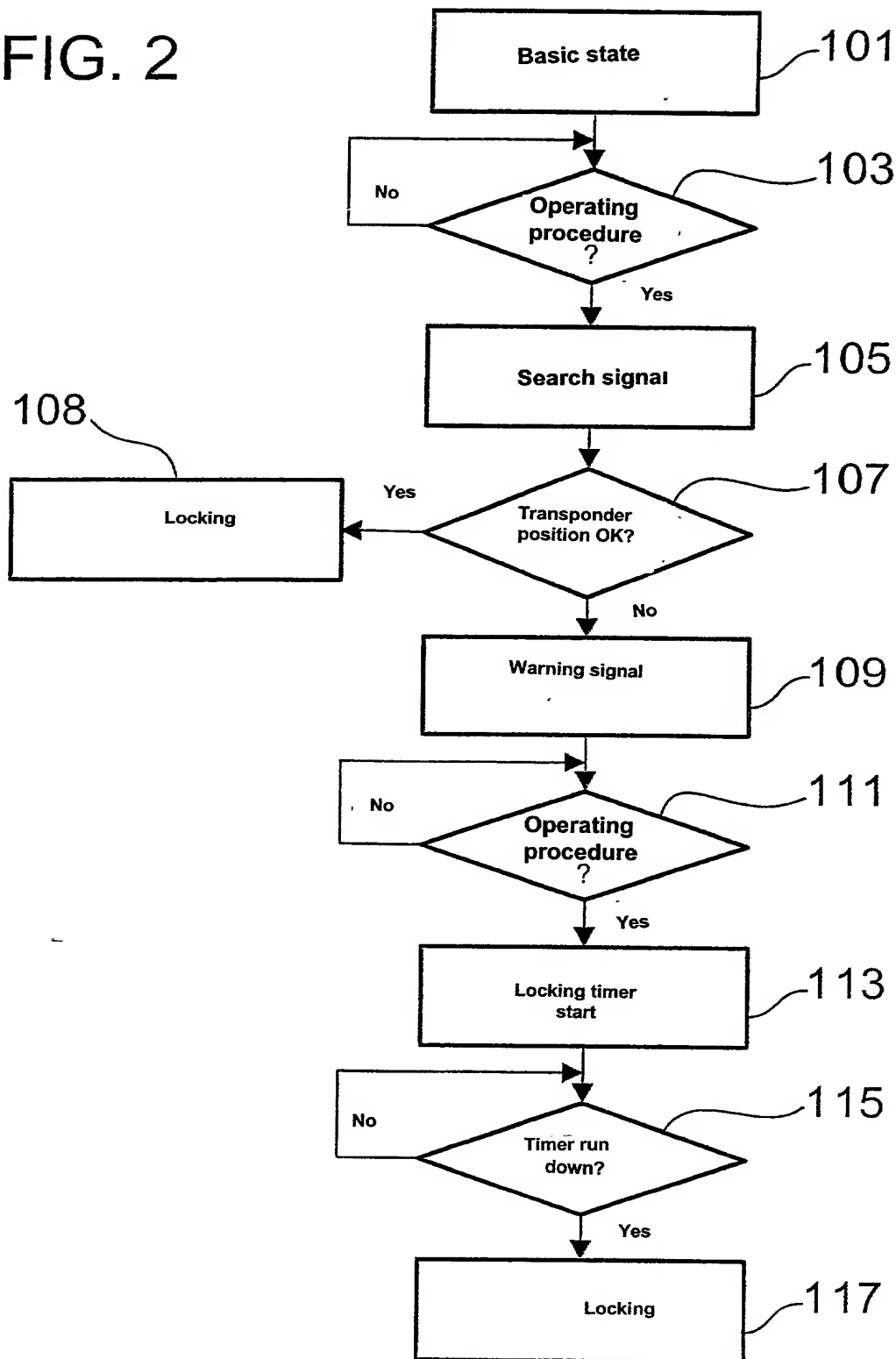
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FIG. 1



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FIG. 2



**DECLARATION AND POWER OF ATTORNEY**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **METHOD OF KEYLESS LOCKING OF A MOTOR VEHICLE**, the specification of which was filed as International Application **PCT/DE00/01560** on May 18, 2000;

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

**PRIOR FOREIGN APPLICATION(S)**

Number	Country filed	Day/month/year	Priority Claimed Under 35 USC 119
199 22 980.5	Fed. Rep. of Germany	19 May 1999	Yes

2LS94613520



And I hereby appoint Richard L. Mayer (Reg. No. 22,490) and Gerard A. Messina (Reg. No. 35,952) my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

2

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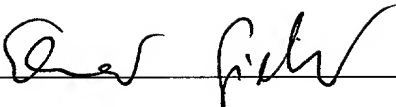
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful and false statements may jeopardize the validity of the application or any patent issued thereon.

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